Test Friday, 11/18

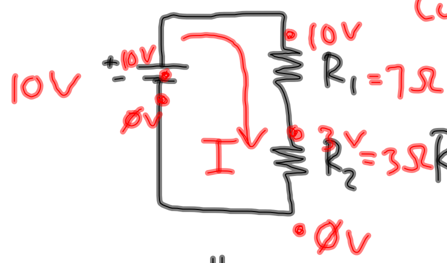
Electrostatics

Circuits

• Equivalent Resistance:

- Resistors control current
- $V = IR$
- We want to know much current, so we need to know equivalent resistance

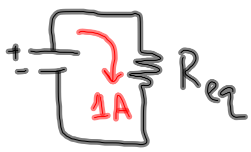
- Series



Current can only follow one pathwa[y]

$$R_{eq} = R_1 + R_2 + \ldots$$

⇓



$$V_{total} = I_{total} R_{eq}$$

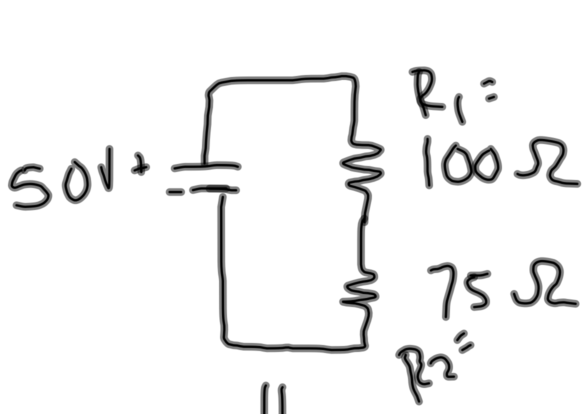
$$I_{total} = \frac{V_{total}}{R_{eq}} = \frac{10V}{10\Omega} = 1A$$

- Voltage drop → how much potential is used in each resistor

- Kirchoff's Laws:
  1. All voltage is used around a loop.
  2. Current into a junction equals sum o[f] currents out of the junction.

$$V_1 = I_{total} R_1 = (1A)(7\Omega)$$

$$V_2 = I_{total} R_2 = (1A)(3\Omega)$$

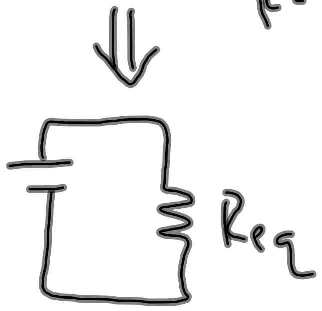


R_{eq} =

I_{total} =

V_1 =

V_2 =



$$R_{eq} = R_1 + R_2$$
$$= 175\,\Omega$$

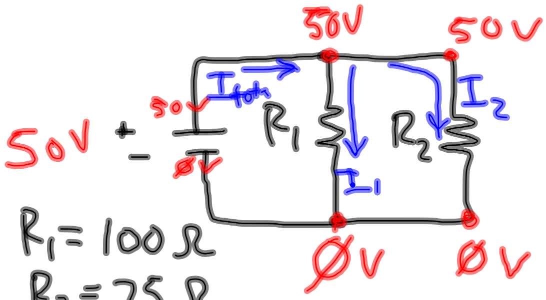
$$V_{total} = I_{total} R_{eq}$$

$$I_{total} = \frac{V_{total}}{R_{eq}}$$
$$= \frac{50\,V}{175\,\Omega}$$
$$= 0.286\,A$$

$$V_1 = I_{total} R_1$$
$$= (.286\,A)(100\,\Omega)$$
$$= 28.6\,V$$

$$V_2 = I_{total} R_2$$
$$= (.286\,A)(75\,\Omega)$$
$$= 21.4\,V$$

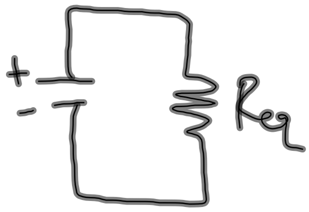
- Parallel:



$R_1 = 100\,\Omega$
$R_2 = 75\,\Omega$

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$$

$$I_{total} = I_1 + I_2$$



$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$R_{eq} = \left[\frac{1}{100\,\Omega} + \frac{1}{75\,\Omega}\right]^{-1}$$

$$= 42.9\,\Omega$$

$$V_{total} = I_{total} R_{eq}$$

$$I_{total} = \frac{V_{total}}{R_{eq}}$$

$$= \frac{50\,V}{42.9\,\Omega}$$

$$= 1.17\,A$$

$$V_{total} = I_1 R_1$$

$$I_1 = \frac{V_{total}}{R_1}$$

$$= \frac{50\,V}{100\,\Omega}$$

$$= 0.5\,A$$

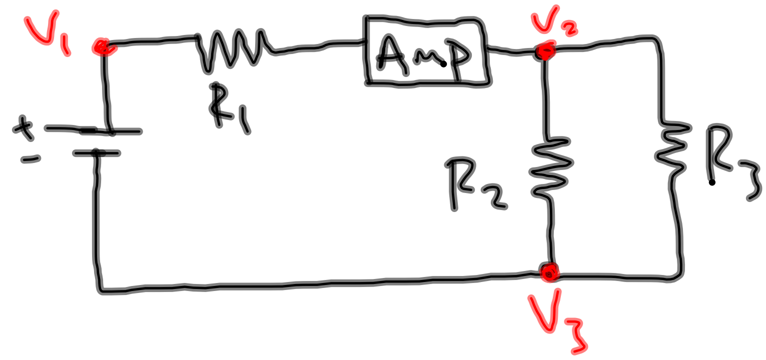
$$V_{total} = I_2 R_2$$

$$I_2 = \frac{V_{total}}{R_2}$$

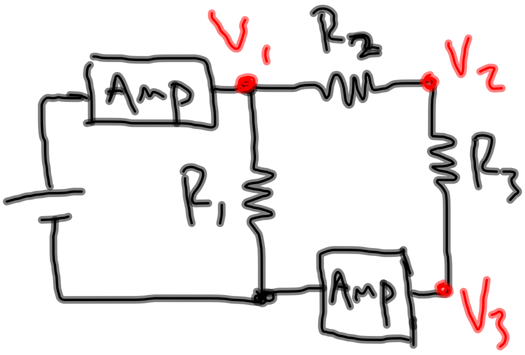
$$= \frac{50\,V}{75\,\Omega}$$

$$= .67\,A$$

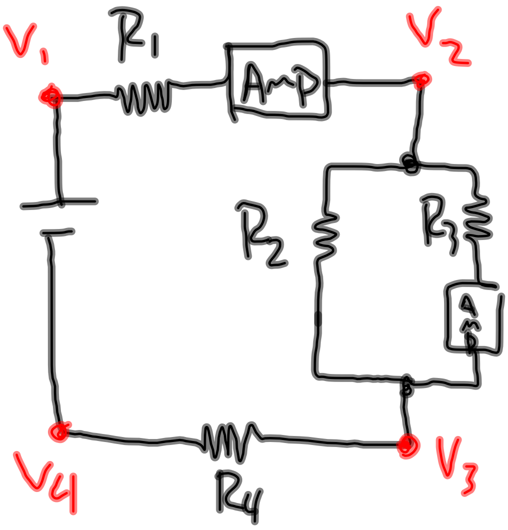
1)


V1
R1
Amp
V2
+
-
R2
R3
V3

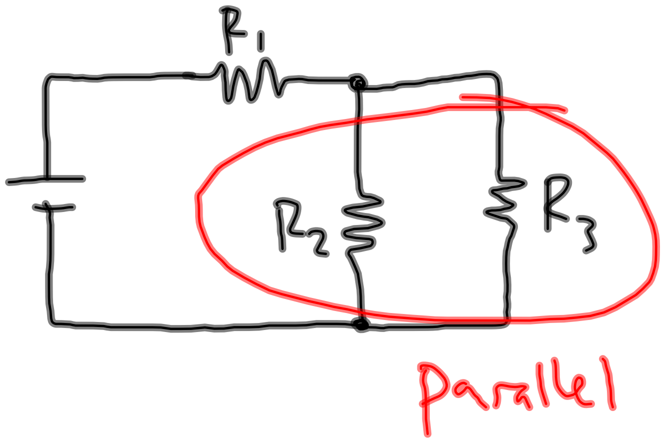
2)


V1
R2
V2
Amp
R1
R3
Amp
V3

3)


V1
R1
Amp
V2
R2
R3
V4
R4
V3

- Reducing Schematics:



Start w/ farthest away resistor

$$\frac{1}{R_{23}} = \frac{1}{R_2} + \frac{1}{R_3}$$